

REMARKS

Claims 1 and 36 are objected to including the word “intensity,” both the two claims have been amended to eliminate reference to intensity. Claims 1 and 36 have been further amended so that the word objected to does not appear any more in these two claims.

The office action mailed on June 17, 2004 is a final action. We believe that this is not correct under M.P.E.P. 706.07(a). Under this section of the M.P.E.P., “a second or any subsequent action on the merits in any application or patent involved in re-examination proceedings should not be made final if it includes a rejection, on prior art not of record, of any claim amended to include limitations which should reasonably have been expected to be claimed.” U.S. Patent 6,483,580 to Xu et al. is not of record in the present application prior to the mailing of this office action. Furthermore, no new limitations have been added to the claims to trigger the rejections presently in the June 2004 office action. It is therefore respectfully requested that the finality of the office action mailed on June 17, 2004 be withdrawn as required under M.P.E.P. 706.07(a).

Claims 1-4, 7, 36-39, 52, 58, 62-65, 78 and 87-90 are rejected under 35 U.S.C. 102e as being anticipated by U.S. Patent 6,483,580 to Xu et al. The rejection is respectfully traversed.

Xu and the rejected claims both concern the measurement of parameters of diffractive structures adjacent to film stacks, and share the common problem that the construction of look-up table or database involving a large number of values for the parameters of the diffracting structures and their associated measurements can be time consuming and cumbersome. However, they take very different approaches to solve the

problem. In one embodiment proposed by Xu, the look-up table is simplified by first finding out the thicknesses and indices of refraction of the films in the film stacks, so that these known values may be used in the construction of the look-up table or reference database, thereby greatly simplifying the table or database that is then subsequently used for the measurement of the parameters of the diffracting structures, such as critical dimension (CD), pitch, height, and side wall angle. The sections in Xu relied on by the Examiner in many of the rejections (column 7, lines 7-67) pertain to such embodiment. Another section of Xu in column 9, lines 1-10 merely indicates that where more than one diffracting structure having different shape parameters are present on the particular wafer and where these diffracting structures have underlying structures of the same characteristics, the measurement of the underlying structure characteristics needs to be performed only once for each wafer and the reference database will need to be constructed only once for the wafer as well. As will be explained in detail below, the rejected claims take approaches which are very different than that of Xu outlined above.

In Claim 1 for example, one will first measure the diffracting structures to obtain measured changes in polarization states of a diffraction from the structure. The “best guess” value or values of one or more parameters of the diffracting structure is then proposed with an associated set of change in polarization state data of the diffraction. An optimized estimation is then performed within the neighborhood of the set of change of polarization state data that is provided using the measured changes in polarization state to arrive at the second set of values of the one or more parameters, which are presumably a better fit to the measured data than the “best guess” value or values in the first set, or which may enable one to find a better fit to the measured data.

The above-outlined features of Claim 1 are therefore very different from and have nothing to do with the embodiment described above in Xu, where the simplification of the database or table is done by first finding out the thicknesses and indices of refraction of underlying film structures. In the rejection of Claim 1, the Examiner has failed to address the above-described features of Claim 1 and has failed to indicate where in Xu such features can be found. The sections in columns 7 and 9 of Xu relied on by the Examiner do not disclose such features.

It is believed to be well-settled that in order for a reference to anticipate a claim, there must be identity of elements between those of the reference and those of the claim. For the reasons explained above, it is believed to be evident that there is no identity of elements between Xu and Claim 1. Furthermore, in view of the fundamental difference between Xu and the method of Claim 1 as described above, it is further believed that there is no reason or motivation for one skilled in the art to modify Xu to arrive at the method of Claim 1. Claim 1 is therefore believed to be allowable. For the same reasons as those explained above for Claim 1, Claim 36 is likewise believed to be allowable.

Claims 2-4 are believed to be allowable and also on the ground of limitations added in these claims. Claim 2 adds features related to the finding of the first set of values of set one or more parameters, or the finding of the “best guess” values. One embodiment of the method of Claim 2 is described on page 11 of the present application. Where the “best guess” value is not known to begin with, according to this embodiment, one may first construct a coarse library of change of polarization state data assuming a corresponding set of values of the one or more parameters. The measured changes in polarization state from the structure are then matched against the values in the library to

find the best match. The value(s) of parameters that are the best match are then used as the “best guess” values and a starting point of the optimized estimation process. Such features clearly are not disclosed by Xu in column 7, lines 10-30. Claim 3 adds the feature that the library of sets of values of the one or more parameters covers expected maximum ranges of the one or more parameters. Since Xu fails to disclose the construction of such a library in order to find the first set or “best guess” values, Xu likewise fails to teach or suggest Claim 3.

As for Claim 4, the Examiner is of the opinion that Xu in column 7, lines 25-35 discloses non-linear regression. We respectfully disagree. Column 7, lines 25-35 of Xu fails to disclose non-linear regression. The various models discussed in such section of Xu are different from and have nothing to do with non-linear regression.

For substantially the same reasons as those discussed above for Claims 2-4, Claims 37-39 are likewise believed to be allowable on account of the features in these claims.

As for Claim 7, the Examiner is of the opinion that column 7, lines 50-65 of Xu discloses the feature in Claim 7. We disagree. Column 7, lines 50-65 describes a process for the calculation of fingerprints in the database, and the use of new film thickness and optical indices for the construction of the reference database. Such section of Xu has nothing to do with supplying the set of values arrived at to a manufacturing instrument.

For substantially the same reasons as those explained above for Claim 1, Claim 52 is likewise believed to be allowable over Xu and all other art of record. In addition, in Claim 52, the diffracting structure is on or under one or more layers and the wavelengths of the intensity or change in polarization state data in the one or more sets provided by

the processor are chosen as a function of the properties of the one or more layers. This is clearly not taught or suggested by Xu. The Examiner has failed to address such limitation in Claim 52. This further differentiates Claim 52 from Xu and confirms that this claim is allowable over Xu.

In Claim 58, a system carries out the measurement of the diffracting structure to obtain measured intensities or changes in polarization state of diffraction from the structure. A data source supplies a library of sets of intensity or change in polarization state data of the diffraction of the wavelengths. The library is arrived at by means of a multimodal process. The measured data is then compared to the library to find a value related to one or more parameters of a 3-dimensional diffracting structure. One embodiment of the apparatus of Claim 58 is described on pages 17-19 of the present application. The sections in columns 7 and 9-11 relied on by the Examiner to reject Claim 58 simply fail to teach any feature which even remotely resembles the above-described features of Claim 58.

Claims 62-65, 78 and 87-90 are believed to be allowable for substantially the same reasons as those explained above for Claims 1-4, 36 and 52.

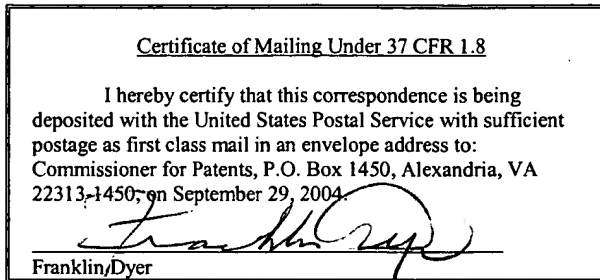
Claim 8 is rejected under 35 U.S.C. 103a as being unpatentable over Xu. The rejection is respectfully traversed. The Examiner is of the opinion that Xu discloses everything claimed in Claim 8, with the exception that where the manufacturing instrument is a stepper or etcher. We disagree. We believe that Xu simply fails to disclose supplying the value found to any manufacturing instrument, whether or not such a manufacturing instrument is a stepper or etcher. If the Examiner disagrees, it is respectfully requested that the Examiner point out exactly the column and line numbers

in the disclosure of Xu that discloses the feature where the set of values obtained by the optimized estimation process is then supplied to manufacturing equipment. One embodiment of the feature in Claim 8 is described on pages 20 and 21 of the present application in reference to Fig. 12.


The Examiner's indication that Claims 9-30, 42-51, 56, 57, 60-77, 82, 83, 93-108 and 112-139 are deemed allowable is noted with appreciation. It is also noted that the office action indicates that Claims 5, 6, 40, 41, 53-55, 59, 66, 67, 70-77, 79-81, 91 and 92 would be allowable if re-written in independent form. This has not been done since the claims upon which such claims depend are also believed to be allowable.

The statement of reasons for the indication of allowable subject matter has been reviewed and we have the following comments. The feature of "choosing a first set of values of the one or more parameters as a function of sensitivity of the change in polarization" in the statement applies to Claim 5 but not to many of the other claims that are also indicated to be allowable. The feature of "storing the eigenvalues and using the stored eigenvalues for obtaining the value of one or more parameters of the diffracting structure" is present in Claim 9 but not in many of the other claims that are also indicated to be allowable. The feature that "wavelengths of the intensity or change in polarization state data in one or more sets are chosen to reduce the influence of the properties of the one or more layers" is present in Claim 22 but not in many of the other claims indicated to be allowable. The feature that "density of the intensity or change in polarization state data provided at the wavelengths in the one or more sets is chosen as a function of sensitivity of the intensity or change in polarization state data to changes in wavelengths" is present in Claim 27 but not in many of the other claims indicated to be allowable.

Claims 1-30, 36-58, 62-83, 87-108 and 112-139 are presently pending in the application. Reconsideration of the rejections is respectfully requested and an early indication of the allowability of all the claims is earnestly solicited.



Respectfully submitted,


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9/29/04
Date